SECRET

[redacted] 25X1

PAR 216

4 June 64

SUBJECT: Exposure of Photographic Materialswith Lasers

TASK/PROBLEM

1. Determine the manner and degree of the interaction of present and predictable future photographic films with coherent radiation from laser sources in red and near IR spectrum ranges.

DISCUSSION

2. Work on this project was started in March 1964. The experimental work was begun with a laboratory setup consisting of the commerical laser with a housing unit, a variety of optical elements for beam control, and a film holder. This setup, which is mounted on an optical bench, is schematically shown in Fig. 1.

3. Exploratory and confirmation exposures have been made on Kodak Type 8401 Pan-X Aerecon Film with both [redacted] 25X1 helium-neon gas lasers. A single film has been used to restrict the number of variables in the experiments. The important observations in these experiments appear to be:

a. There is adequate energy available to flash panchormatic film. Exposure times of 1/100 to 1/200 second produce flash densities greater than 1.0, using a divergent beam.

b. It seems impossible to produce a uniform flash that is free from mottle. The pattern varies with the two ends of the laser and appears to come from surface imperfections in the partially reflecting end mirrors. Exposure A, Figure 2, shows an example of this pattern at the edge of the spot.

c. Dust particles on the diverging optics produce enlarged Newton Rings as illustrated in Exposure B, Figure 2. Special care may be required to eliminate dust and scratches on any optics in the laser beam.

d. Process gamma, using Type 8401 film, from laser illumination is significantly lower than that obtained with tungsten illumination. Comparative curves are shown in Figure 3.

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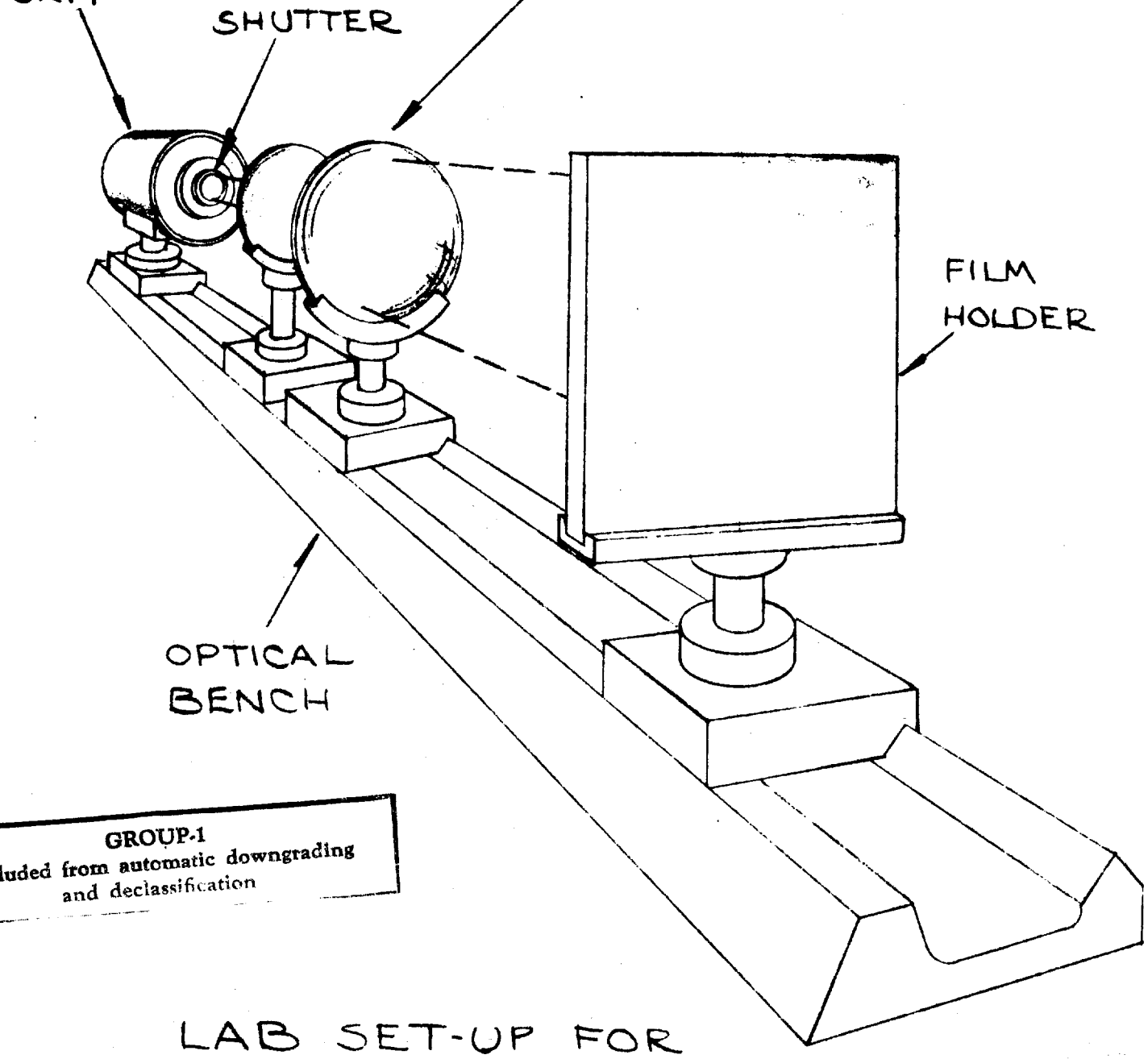
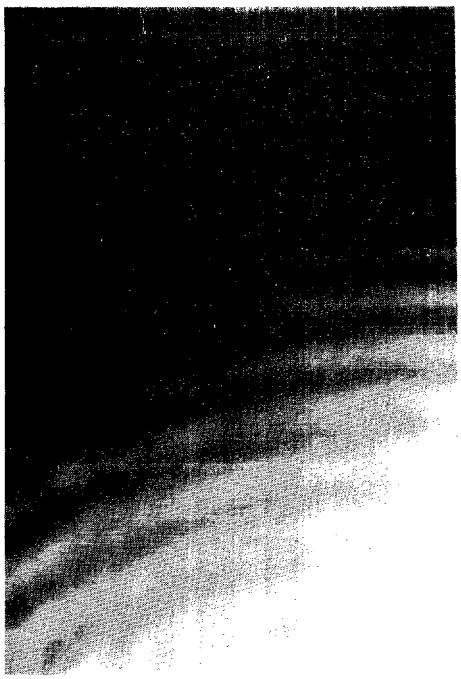
TYPICAL LENS ARRANGEMENT
TO ENLARGE BEAM DIAMETER



LAB SET-UP FOR
LASER PHOTO STUDY

FIG. 1



Exposure A. Typical pattern in flash exposure to laser source.

Exposure B. Newton Ring patterns produced by dust particles and by a dot-dash reticle pattern on optical surfaces in the laser beam.

Fig. 2

Comparative sensitometric curves for Type 8401 film exposed to helium-neon laser illumination and to tungsten (white) light

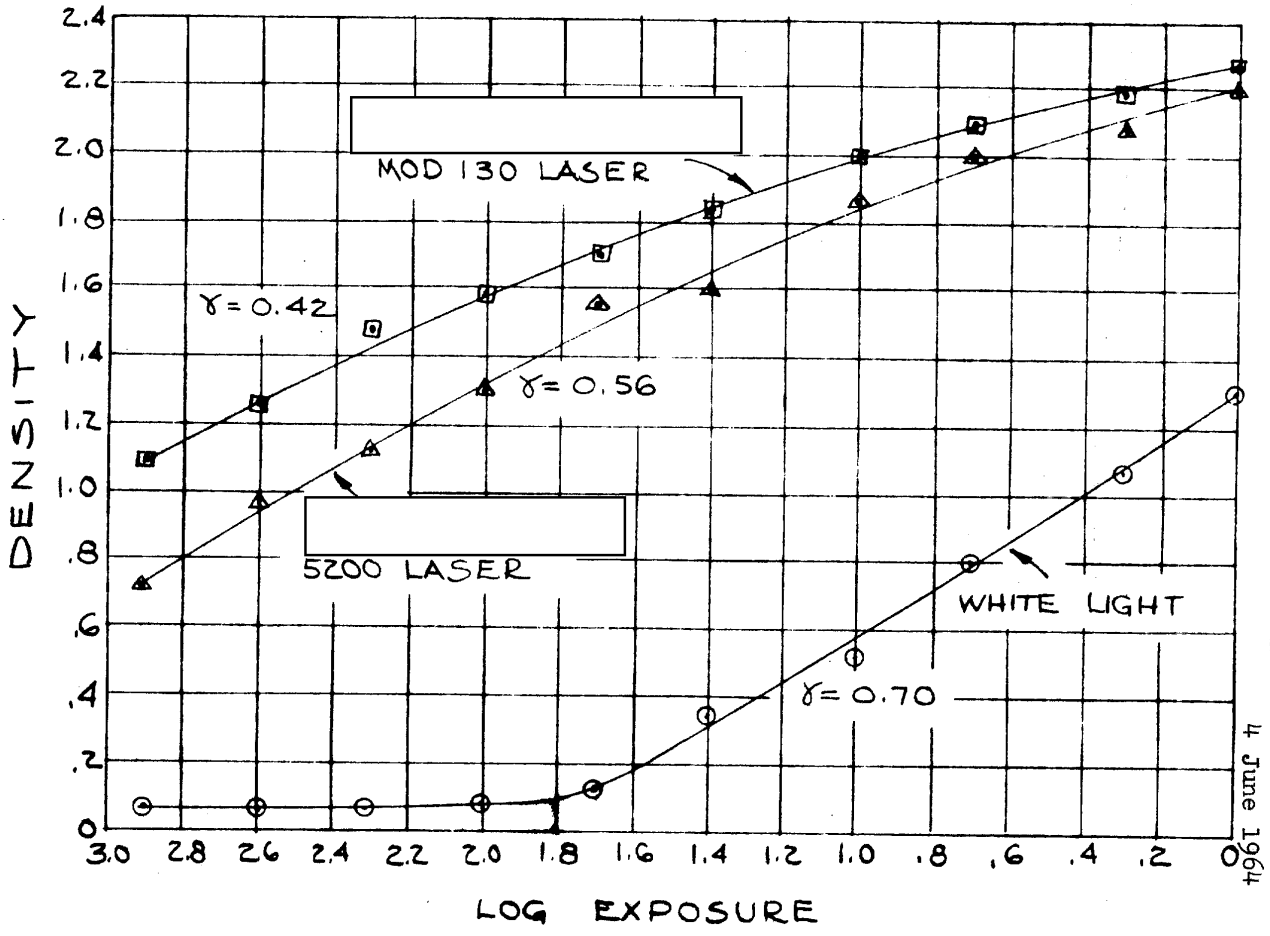


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Figure 3

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e. In projection printing a reticle with the laser source, there are several discrete positions of the lens for a fixed object-image distance which produce a discernible image. The quality of the various images is not the same, and the pattern of the lens positions is not understood.

PLANNED ACTIVITIES

4. During the next quarter, a more detailed study of Item 2e will be undertaken. Attempts will be made to improve the image quality and to evaluate the versatility of the technique.